

What is claimed is:

1. A method for fabricating a semiconductor device, comprising the steps of:

(a) depositing an insulator composed of a single layer film of silicon oxide, silicon nitride, or silicon oxynitride or an insulator composed of a laminated film of two or more films selected from the single layer films over a semiconductor substrate by a chemical vapor deposition method; and

(b) performing a plasma treatment in an atmosphere containing oxygen atoms to said insulator.

2. The method for fabricating a semiconductor device according to claim 1,

wherein the thickness of said silicon oxide formed over the semiconductor substrate by the plasma treatment is within the range of a 60% minimum limit to a 140% maximum limit of that of said insulator formed by the chemical vapor deposition method.

3. The method for fabricating a semiconductor device according to claim 1,

wherein said insulator, formed by the chemical vapor deposition method, is formed by an atomic layer deposition method.

4. The method for fabricating a semiconductor device according to claim 1,

wherein said plasma treatment is a treatment of the plasma mainly composed of ions containing oxygen atoms.

5. The method for fabricating a semiconductor device according to claim 1,

wherein the pressure in a treatment chamber in said plasma treatment is 1 Pa or more and 200 Pa or less.

6. The method for fabricating a semiconductor device according to claim 1,

wherein said atmosphere contains water.

7. The method for fabricating a semiconductor device according to claim 1,

wherein said atmosphere contains an inert gas, and the flow rate of said inert gas is higher than that of said gas containing oxygen atoms.

8. The method for fabricating a semiconductor device according to claim 1,

wherein the film-forming temperature in said chemical vapor deposition method is 700°C or higher.

9. A method for fabricating a semiconductor device, comprising the steps of:

(a) depositing a relatively thick insulator made of silicon oxide over a semiconductor substrate by a chemical vapor deposition method;

(b) performing a plasma treatment to said relatively thick insulator in an atmosphere containing oxygen atoms; and

(c) patterning said relatively thick insulator so that said relatively thick insulator can be left at least in a thick-film region over said semiconductor substrate.

10. The method for fabricating a semiconductor device according to claim 9, further comprising the steps of:

(d) after said step (c), performing at least a thermal oxidation treatment to said semiconductor substrate, thereby forming a relatively thin insulator in a thin-film region over said semiconductor substrate; and

(e) forming gate electrodes in said thick-film region and said thin-film region.

11. The method for fabricating a semiconductor device according to claim 9,

wherein said thick insulator is formed so as to be left also in isolation regions adjacent to said thick-film region in said step of patterning the relatively thick insulator.

12. The method for fabricating a semiconductor device according to claim 11, further comprising the step of:

forming trench isolations in said isolation regions.

13. A method for fabricating a semiconductor device, comprising the steps of:

(a) depositing a relatively thick insulator made of silicon oxide on a semiconductor substrate by a chemical vapor deposition method;

(b) performing a plasma treatment to said relatively thick insulator in an atmosphere containing oxygen atoms;

(c) patterning said relatively thick insulator so that said relatively thick insulator can be left at least in a thick-film region over said semiconductor substrate;

(d) depositing a relatively thin insulator composed of a single layer film of silicon oxide, silicon nitride, or silicon oxynitride or composed of a laminated film of two or more films selected from the single layer films over said semiconductor substrate by the chemical vapor deposition method;

(e) performing the plasma treatment to said relatively thin insulator in an atmosphere containing oxygen atoms; and

(f) forming gate electrodes in said thick-film region and said thick-film region.

14. The method for fabricating a semiconductor device according to claim 13,

wherein said relatively thin insulator is formed to cover also isolation regions of said semiconductor substrate.

15. The method for fabricating a semiconductor device according to claim 14, further comprising the step of:

forming trench isolations in said isolation regions.